

## SOIL RELEASE AGENTS HAVING ALLYL-DERIVED SULFONATED END CAPS

This is a continuation of application Ser. No. 5 07/237,598, filed on Aug. 26, 1988.

### TECHNICAL FIELD

The present invention relates to novel soil release agents, which are ester oligomers of a kind which may readily be formulated into laundry products such as laundry detergents or fabric conditioners. Thus formulated, they are suitable for use in a home laundry operation. Effective, renewable soil release treatment of fabrics is provided.

Preparation of the novel soil release agents involves ester chemistry and, in the preferred embodiments, radical-initiated sulfonation chemistry designed to produce substantially linear, relatively low molecular weight terephthalate ester oligomers having end-capping moieties each comprising disulfonate or sulfinate-sulfonate.

### BACKGROUND OF THE INVENTION

A substantial proportion of synthetic fabrics now in use are copolymers of ethylene glycol and terephthalic acid, sold under trade names which include DACRON, FORTREL and BLUE C POLYESTER. The removal of oily soil and oily stains, which are hydrophobic, from the surfaces of such fabrics, which are likewise hydrophobic in character, is well recognized to be technically difficult to achieve using laundry compositions of the type most generally accessible to consumers.

It has been recognized in the art that the provision of substances which attach to the surfaces of polyester fabrics and render them more hydrophilic in character is helpful in achieving improved oily soil and oily stain release from such fabrics. Substances which have been used in consumer products as soil release agents are generally copolymers of moderately high (e.g., 40,000 to 50,000) molecular weight, containing ethylene terephthalate segments randomly interspersed with polyethylene glycol segments. See, for example, U.S. Pat. No. 3,962,152, Nicol et al, issued June 8, 1976; a soil release polyester of this type, commercially known as MILEASE T, is further disclosed in U.S. Pat. No. 4,116,885, Derstadt et al, issued Sept. 7, 1978; other commercial variants are PERMALOSE and ZELCON (see Canadian Pat. No. 1,100,262, Becker et al, issued May 5, 1981 and U.S. Pat. No. 4,238,531, Rudy et al, issued Dec. 9, 1980).

The development of new soil release agents delivering technically outstanding soil release performance cost-effectively in consumer laundering and fabric care compositions is not straightforward. To be particularly useful, efficient adsorption and surface coverage of polyester fabric surfaces by the soil release agent must occur, with minimum interference from the product matrix which is being used as a vehicle to convey the soil release agent to the fabric surface. Matrix interferences, when they occur, not only decrease the effectiveness of the soil release agent, but also reduce the cleaning, softening and/or antistatic benefits of other ingredients which may also be present in the product. Formulability of the soil release agent is also a major consideration, since the limited solubility and/or dispersibility of art-taught polyesters frequently imposes serious constraints on the range of formulations into which the soil

release agent may stably be introduced. Such challenges are generally absent from compositions used in industrial textile treatments, but are well-known to manufacturers of fully-formulated consumer products.

Various materials, especially the oligomeric anionic endcapped esters described by Gosselink in U.S. Pat. No. 4,721,580, issued Jan. 26, 1988, have been disclosed for use as soil release agents. Thus, useful and relevant background can be drawn from a reading of polyester chemistry, for example as summarized in the background portion of the Gosselink patent.

Gosselink goes on to describe particular oligomeric esters which are useful as soil release agents in laundry products. The ester compositions provided by Gosselink encompass substantially linear ester oligomers which have one or two monosulfonated end-caps, as illustrated by  $Q''-\{-Z-O-R-O\}_yH$  and  $\{Q-Z-O-R-O\}_xZ-Q'$  respectively, wherein Z is terephthaloyl, R is 1,2-propylene and each of the groups Q, Q' and Q'' is  $MO_3S(L)(CH_2CH_2O)_m$  or  $MO_3S(CH_2CH_2O)_m$ . L is  $C_1-C_6$  alkoxy, M is a metal cation and x and y are consistent with oligomers of low molecular weight.

The syntheses of the Gosselink esters are likely to be rather expensive, at least inasmuch as those specifically illustrated rely on reactive chlorinated starting materials known to be corrosive and difficult to handle.

Gosselink has also provided other oligomeric ester soil release agents; see, for example, U.S. Pat. Nos. 4,702,857, issued Oct. 27, 1987; 4,711,730, issued Dec. 8, 1987; and 4,713,194, issued Feb. 15, 1987. These soil release agents, like those of the '580 patent, contain terephthalate, but have a nonionic, i.e., uncharged, capping groups.

Utility of the foregoing oligomeric ester materials as soil release agents in laundry products notwithstanding, the search for improved soil release agents has continued, in view of an ongoing need to further improve the economics, soil release properties and formulability of the soil release agents in specific laundry product matrices.

Soil release agents having allyl-derived or methallyl-derived end-caps are not apparently known in the art. At the outset of the work now described, such incorporation appeared, in chemical terms, to represent a difficult goal. Thus, sulfonating a simple olefin, having only one reactive group, and sulfonating an ester oligomer, containing several different, potentially reactive groups, are two very different matters. Also, it was unclear whether any soil release benefit might result, or whether instead the sulfonated ester would then be less effective (e.g., overly soluble and not inclined to deposit on fabrics).

In view of the foregoing, it would be desirable to provide improved soil-release ester oligomers.

It is an object of the present invention to provide such materials, structurally altered especially in the composition of the end-caps.

It is a further object of the invention to provide useful oligomeric ester compositions comprising the novel oligomers in admixture with other soil-release effective esters, such as the monosulfonate end-capped esters specifically disclosed by Gosselink or obvious variants thereof.

It is yet another object of the invention to provide useful